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AMERICAN DOCTORAL DISSERTATIONS.

H. J. ETTLINGER, "Existence theorems for the general real self-adjoint linear system of the second order," *Transactions of the American Mathematical Society*, vol. 19, January, 1918, pages 79-86. (First part of dissertation, Harvard, 1919).

PROBLEMS AND SOLUTIONS.

EDITED BY B. F. FINKEL AND OTTO DUNKEL.

Send all communications about Problems and Solutions to B. F. FINKEL, Springfield, Mo.

PROBLEMS FOR SOLUTION.

[N.B. The editorial work of this department would be greatly facilitated if, on sending in problems, the proposers would also enclose their solutions—when they have them. If a problem proposed is not original the proposer is requested *invariably* to state the fact and to give an exact reference to the source.]

2850. Proposed by SARAH BEALL, U. S. Coast and Geodetic Survey.

An unknown star is observed at the altitudes h_1 and h_2 at the respective times t_1 and t_2 , the latitude being known also. Obtain formulas for the right ascension and declination of the star: (1) when the time interval $t_2 - t_1$ is large: (2) when the time interval is so small that $(h_2 - h_1)/(t_2 - t_1)$ may be taken as the value of dh/dt corresponding to the mean altitude $(h_1 + h_2)/2$ and the mean time $(t_1 + t_2)/2$. This problem sometimes arises when a bright star is observed through the clouds.

2851. Proposed by HILLEL PORITSKY, Cornell University.

Does there exist an analytic function, satisfying the functional equation, $f(z+1) = e^{f(z)}$?

2852. Proposed by D. H. RICHERT, Bethel College, Newton, Kan.

What is the radius of a cylinder inscribed in a right cone, radius of base $R = 5$ inches, and altitude $h = 18$ inches, the volume of the cylinder to be $(1/n = 3/4)$ that of the cone?

2853. Proposed by J. S. BROWN, Southwest Texas State Normal College, San Marcos, Texas.

Find the side and apothem of a regular pentagon inscribed in a circle, without the use of extreme and mean ratio.

2854. Proposed by C. N. MILLS, Heidelberg University.

Solve the simultaneous equations for x and y ,

$$x^n + y^n = a_n, \quad x^{n-1} + y^{n-1} = a_{n-1}.$$

2855. Proposed by J. L. RILEY, Stephenville, Texas.

Show that the circle of curvature at any point of the ellipse cannot pass through the centre unless the eccentricity be greater than $1/\sqrt{2}$.

2856. Proposed by O. S. ADAMS, U. S. Coast and Geodetic Survey.

Show that for the real domain defined by $+1 > x > -1$, s a positive integer,

$$\frac{1}{(1-x^s)^{1/s}} \int_0^x \frac{dx}{(1-x^s)^{(s-1)/s}} = x + \sum_{n=1}^{n=\infty} \frac{2(s+2)(2s+2) \cdots (ns-s+2)}{(s+1)(2s+1) \cdots (ns+1)} x^{ns+1}$$

and

$$\frac{1}{(1-x^s)^{(s-1)/s}} \int_0^x \frac{dx}{(1-x^s)^{1/s}} = x + \sum_{n=1}^{n=\infty} \frac{n! s^n}{(s+1)(2s+1) \cdots (ns+1)} x^{ns+1}.$$

2857. Proposed by the late L. G. WELD.

A savings bank offers to pay 3% interest on deposits, said interest to be continuously compounded, *i.e.*, compounded at infinitesimal intervals of time. What would be the amount of \$1.00 for one year?